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ABSTRACT

Universities and colleges have attempted to enhance education through the use of video teleconferencing. This paper reports on a videoconferencing effort between two campuses of the Virginia Polytechnic Institute and State University using synchronous two-way audio and video equipment to allow two groups to interact. The teleconference was facilitated by television cameras and microphones at both locations that permitted video and audio to be transmitted in both directions. The two campuses in the study are located in rural and urban areas and serve as sites for teacher education graduate programs in mathematics and science. The collaborative action research study described in this paper is an investigation of students' use of videoconferencing as a reflective tool for sharing ideas and programmatic experiences in two contrasting locations and cultures. Contains 17 references. (WRM)

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PREPARING SCIENCE TEACHERS USING DISTANCE LEARNING: URBAN AND RURAL STUDENTS COLLABORATE USING VIDEO TELECONFERENCING (VTEL) TECHNOLOGY

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Running Head: STUDENTS COLLABORATE USING VTEL

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Universities and colleges have attempted to enhance education through the use of video teleconferencing (videoconferencing or VTEL) for the past several years. Our videoconferencing involved communication between two of our campuses using synchronous two-way audio and video equipment to allow two groups to interact. This form of configuration was facilitated by television cameras and microphones at both locations that permitted video and audio to be transmitted in both directions. These two campuses, located in rural and urban locations, served has sites for teacher education graduate programs in mathematics and science. In this collaborative action research project, we investigated students' use of videoconferencing as a reflective tool to share ideas and programmatic experiences in two contrasting locations and cultures.

Advantages of Videoconferencing

Schiller and Mitchell (1993) researched the possibilities of various techniques when utilizing videoconferencing. This type of technology was considered effective when student and teacher sessions indicated a high level of interaction, as though everyone were in the same room. The advantages of videoconferencing, according to Miller and associates (1993), included an increased number of students in a particular session or course, and the reduction in travel time for all individuals involved. While we believe that VTEL may promote collaboration and exchange of ideas between students in different locations, Miller maintained that distance learning has been developed primarily because of economic concerns, and not because achievement might be enhanced. In another study, Freeman (1998) researched the advantages and disadvantages of focusing on large classes with multiple campuses involved. He indicated there were substantial costs involved at the onset of utilizing this technology. However, the advantage of reduction in both cost and time over the life of a variety of courses, especially in larger classes and multi-campus locations, might be a major advantage. Willis (1992), Bates

(1991), and Rowntree (1990) cautioned that specialized equipment and technical assistance are required. Viewers are conditioned by commercial television to be passive recipients of information. Motivating active participation and interaction requires special instructional design considerations and systematic planning. Although colleges are learning to make student participation more than just "watching television," distance learning programs are struggling to combine the curriculum to meet the personal needs of each student (Pirkl, 1990) and VTEL might prove to be advantageous in that area.

Research Focus

An emerging research tool used in recent years to better understand and improve teacher thinking has been the use of collaboration and collaborative action research (Pate, 1997; Elliott, 1990; Noffke & Zeichner, 1987; Carr & Kemmis, 1983). In our study, we were interested in how the use of these collaborative techniques might better prepare our pre-service science teachers through the use of VTEL technology. When we refer to action research by any name, we are actually referring to a subset of action research called *collaborative action research*. More specifically, we are further referring to a subset of collaborative action research that we will define as *collaborative group action research*. In our study, we made use of collaborative group action research to answer our research question concerning the use of VTEL as a distance learning tool to enrich the preparation of our science teachers.

The overall concept of "action research," as illustrated in Figure 1, has its foundation in the work of Kurt Lewin (1947). Lewin is most often cited as the "founder" of this form of research, which he called "action research," because he combined interventive actions and group research. Lewin took an existing group, introducing a change or action to it through a group facilitator, and observing the impact of such change or action. Lewin's study of "group dynamics" used a cylindrical process involving a

recursive, nonlinear pattern of planning, acting, observing, and reflecting on changes in social situations observed by the facilitator. For the purposes of our study, we are using Lewin's definition of action research as the basis of our definition of collaborative group action research.

Our collaborative action research is about pre-service teachers becoming more acutely aware of what is happening in their preparation process and developing a research focus upon their practice (Wraga, 1997). We are now finding that action research has and will continue to be used to look at roles and processes that initiate changes not only in education, but in areas such as industry, community, development, and the military (Noffke, 1995). The addition of the word "collaborative" to action research, illustrated as

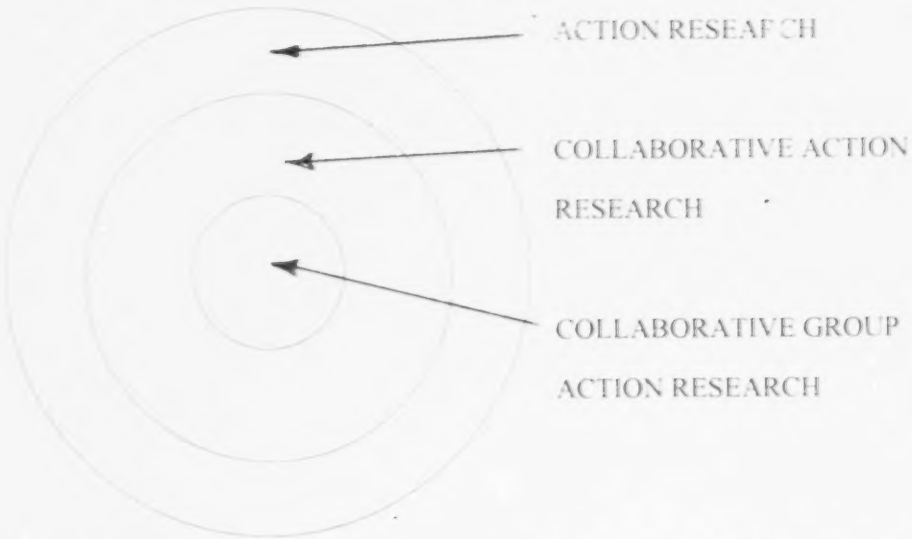

Figure 1. Relationship of collaborative group action research to collaborative action research and action research

a subset of action research in Figure 1, implies that two or more researchers are working

together. These researchers are actively exchanging ideas and expertise and are continually interacting as they conduct action in an effort to be more productive than if they worked alone. The collaborators meet together regularly to plan, conduct, reflect, and write about the action research they are conducting. There are different forms of collaboration and the setting for our collaborative efforts was a collaborative group of pre-service teachers and university educators. The use of the word "group," illustrated by the smallest subset of action research in Figure 1, emphasizes the true value of this approach to research because the research is done by a group of educators all involved in classroom-based research. The group setting allowed for regular interaction among the researchers and a place for discussion, brainstorming, reflection, accountability, and organization of the process.

In summary, we define collaborative group action research for the purpose of this study as a group of pre-service teachers and university researchers actively working together to ask questions of interest in an attempt to find answers that might help improve their practice. The ultimate beneficiaries of the process are the students, yet the teachers and university researcher also benefit from the new and relevant knowledge gained by experiencing the process. In addition, we see collaborative group action research as a methodology, a process of conducting research using a particular sequence of research strategies and theoretical perspectives (Saurino, 1998; Saurino & Saurino, 1996).

The varieties of collaborative action research are as numerous as the potential topics that can be addressed. However, the various types of action research do have a few common characteristics. Collaborative action research is generally qualitative in nature, aimed at developing new insights into schooling, education, teaching, learning, and/or finding new approaches to solving problems in education. Collaborative action researchers are interested in a deeper, richer understanding of the topic of their research.

This type of research also involves reflection, which provides the researcher an avenue to better understand what was learned from the research process and to better understand the implications of the findings. The research continues by repeating the process again, and begins with either a completely new question or a refinement of the initial question based on what was learned during the first research sequence. Therefore, collaborative action research can be an ongoing recursive sequence; each completed series of research steps often referred to as a "cycle" of research. The term cycle is a little misleading, however, since the research never begins at the same point as the term "cycle" implies (Saurino, 1998).

Our Cycle of Collaborative Group Action Research

Our action research process utilized a particular sequence of research techniques, strategies, and perspectives. The research group in our study consisted of two groups of pre-service middle grades and secondary science teachers, and several university collaborators. Three VTEL meeting sessions were scheduled throughout the Fall Semester of 1998, and an informal atmosphere was maintained. The group meetings provided a place where questions were asked and answered, problems were discussed, and reflections were expressed. The group setting also provided an avenue to brainstorm for new ideas, strategies, and techniques used to initiate actions, solve problems, and ultimately answer the research question.

The research process completed by our study involved four chronological phases and a planning phase for future cycles. The four chronological phases were based on the recursive collaborative group action research cycle outlined below and illustrated in Figure 2.

Phase 1: August 1998	Planning Phase of the project and Cycle 1
Phase 2: September 1998	Baseline data collection

Phase 3: September-November 1998	Interaction Sessions 1 through 3
Phase 4: December 1998	Repeat baseline data Reflection for Cycle 1
Phase 5: January 1999	Return to Planning phase for future cycles

Phase 1 through 4 comprise the first research sequence of "Cycle 1" and Phase 5, and any following phases, might repeat the cycle to gain more information. After the first cycle, research questions could be modified or replaced, based on what was learned to date. A complete cycle, as conducted in our study, consists of the phases outlined in Figure 2.

Phase 1 (Planning Phase in Figure 2) began in August 1998 with initial meetings of the pre-service teachers and the university researchers. The students had volunteered to do the research after being contacted by the university researchers, but did not know any

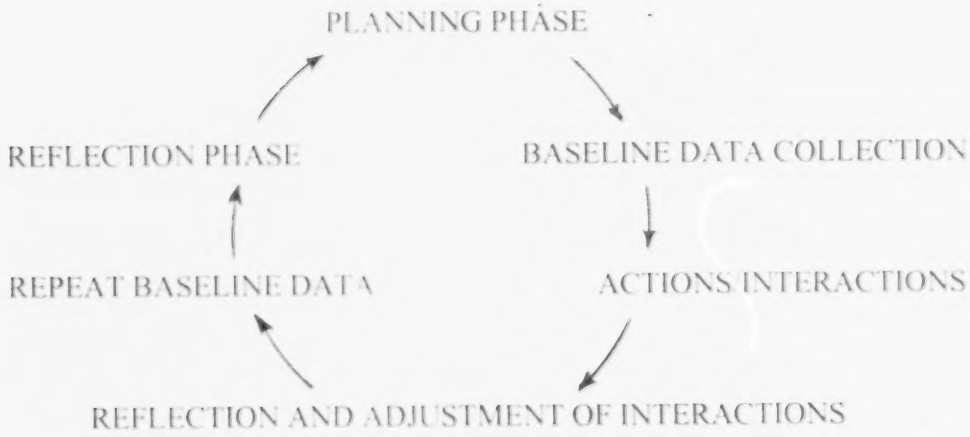

Figure 2: Illustration of one recursive sequence of collaborative group action research, often referred to as a "cycle."

particulars about the process of conducting this type of research. The general plan of creating a research question, actions and interactions, collecting data, and reflecting was

discussed and a basic time line for the cycle of research was established. The students had a variety of questions and concerns that were expressed and discussed. Their most arduous concern dealt with the amount of time required to complete this project. The university researchers emphasized the fact that the process was flexible and the time line could be adjusted.

During the project, meetings were audio-taped and field notes created from observations. These data were the source for this written report. By the end of the planning phase we had finalized the research question for the cycle. The finalized research question was as follows:

How can videoconferencing(VTEL) enrich the preparation of graduate pre-service science teachers?

Graduate students attending Virginia Tech, located in two different geographical locations, participated in the VTEL sessions as part of their course-work for the Mathematics and Science Masters Degree Program in the Fall of 1998. Students at the main campus, located in the more rural southwestern portion of Virginia, represented the more traditional graduate students engaged in their planned major with little real work experience within their major field of study. The extended campus, located in the Northern Virginia metropolitan area, consisted mainly of students entering mid-career changes. These students held previous positions within the military, government, or corporate organizations and had extensive work experience. Students from both campuses had been selected to go through the program as a cohort, for a specified time frame until completion of the Master's Degree.

Utilizing the concept of distance learning to enrich each students personal internship experience was the major intention of the University faculty members. The purpose was to provide the students with the opportunity to engage in discussion which

could enhance their pre-service teaching experience in the mathematic and science education degree program. Each campus was equipped with appropriate technology including television monitors, cameras, microphones, and control panels to establish videoconferencing connections with the cohort members. The technology also included general open microphones and special push-to-talk microphones which also directed and zoomed the camera for a close-up of the speaker pushing the microphone. The combination of microphones allowed for general and individual interaction throughout the sessions.

Phase 2 (Baseline Data Collection in Figure 2) would normally be a collection of data that answered the question, "What is the current situation in reference to our research question?" However, since we were beginning a new project there was little data to collect. The current situation was that we had never tried the form of distance learning interactions we were attempting, nor could we find any other research on the specific topic. Our baseline data summarized that we intended to try a series of VTEL sessions with varying themes to see how the technology might be utilized to enrich the preparation of our pre-service teachers.

Phase 3 (Actions/Interactions, Reflection and Adjustment of Interactions in Figure 2) began with our first VTEL session in September. Although all the university professors participated in the sessions, the traditional lecture style approach was excluded and shared experiential conversation using a theme question was utilized. The approach was a novel experience for all participants, as the first observations reflected. The "Blacksburg" group was the main campus, rural southwestern Virginia cohort, and the Northern Virginia group was the urban mid-career cohort:

> Field Notes Summary-Session 1 (September, 1998): The discussion appeared awkward initially, as Blacksburg looked at the National Science Education

standards, and Northern Virginia looked at the Standards of Learning. Since the Northern Virginia students had already been in the local school's classrooms, the initial discussion was dominated by topics such as: how to develop complementary science/math lessons; comfort level of SOLs with teachers, and making course work relevant. Blacksburg students made reference to the abundance of technology in Northern Virginia and the conversation shifted to comparisons between rural southwestern Virginia and northern Virginia.

There was a strong interest in the diversity of cultural experiences within the educational system in Northern Virginia. However, this interest was articulated and expressed by students located in the urban environment. Students from the rural environment were more apprehensive about working with students from diverse backgrounds. This may be because they were younger students who by and large had not experienced careers. (Students in the urban program were second career people with varied career experiences such as military, government, etc.) Nevertheless, participants interpreted this initial session as an opportunity for cultural exchange. The introductory session allowed the students to acquaint and familiarize themselves with this form of technology.

The technology allowed for fluent interaction, yet there was a need for the groups to adapt to flow from one campus group to the other. As the conversation led to a verbalization of where the students were with their respective programs, the following excerpt reflects the content and pacing of the initial interactions:

Researcher #1 (Blacksburg): Our students do not go out into the field for another three weeks. We are set up a little differently. (He continues to discuss what his students are presently engaged in).

Researcher #2 (Northern Virginia): Our students have been working more with

the Virginia SOL's and they have been specifically looking at the local school environment. They will have some discussion questions for the group.

Researcher #1 : I think the best thing to do is to let the students start talking, so I am going to be quiet.

One of the Northern Virginia students began the discussion with a question having to do with how math and science were being integrated in the different area schools.

Student 1 (urban): One of the things we've discovered with just our first three days in the classroom is that all of our sponsored teachers have a wide variety of experience with the SOLs and integrated curriculum in middle school and high school.

Student 2 (rural): I think some of us are kind of afraid to talk to you guys since we haven't had a chance to actually go into the schools yet. I know I'm looking forward to meeting with some of the teachers and talking to them abut real life and what really goes on in the classroom.

Student 3 (urban): (Describing his typical day in the classroom) It is difficult to get into a group environment (for integration) because of the old standard desks. There are no tables.

Researcher # 1: I think this makes a very good point about the control of facilities. Many times you have to overcome barriers.

Student 3 (urban): It is interesting to see all the technology they have available to the students. (describes all equipment being utilized) It will be interesting to see what is up here and what they have in the more rural areas.

Several topics were discussed in the session and individuals were encouraged to ask questions of personal interest, such as in the following exchange:

Student 4 (rural): I have a question for the science people. I know that I'm

planning on putting this rural area to good use and implementing field study and outdoor research as much as I can. Have any of your advising teachers had any experience with that, and if so, do they think it works?

Student 5 (urban): I know in my high school they take field trips to natural parks and even to Fairfax Hospital to watch open heart surgery. They may not have some of the same opportunities you see in your area, but they are certainly exposed to things outside the classroom.

The next two sessions maintained similar formats with discussion questions covering a variety of topics. Some of the issues raised are included in the following excerpts:

Topic Question: Did you perceive any instances of teacher administrator preference or discrimination, for example by gender, ethnic origin, or social class?

Student 6 (urban): As far as I can tell in my classroom, the teacher calls on both genders equally and there does not appear to be any bias with respective to any particular ethnic group.?

Student 5 (urban): My cooperating teacher has made an effort to call on every student at least once and I'm trying to do this as well.

Student 7 (urban): I'm teaching high school biology. The balance of my classroom is largely Middle Eastern and Hispanic. I have seen no preference except for student's who are more performance driven, which is the tendency when the classrooms are large. The focus is on the people who always have their hands raised and always turning their work in on time and listening attentively.

Researcher # 3 (Blacksburg): Were there any signs of subtle discriminations, and I'll give you an example; pictures of famous mathematicians or scientists used in the classroom being inclusive rather than exclusive?

There was concern regarding giving certain populations of students enough time to

answer questions, or to write assignments. The recognition of body language used as avoidance of being called upon was also discussed briefly, before the following:

> Student 8 (urban): When I first started, I would not call on kids unless they raised their hand. Then I went to "back to school night" where parents expressed their concern over their kids not being called on. They didn't want their kids to be excluded, or to get away with no participation. Some just needed a little push to get going.
>
> Student 7: I was happily able to discover they have a flexible camera in my classroom and I was able to get the microscope in focus with the cell I was looking at. Being able to broadcast the microscope onto the screen in the classrooms helps the students tremendously to stay involved.
>
> Student 9 (rural): A teacher I know talks about giving each student a bag of M&Ms. They pour them out on the table and sort them. They have tables and graphs to fill out. They get to talk about their experience and everybody seems happy. Plus, they get to eat the M&Ms.
>
> Student 5: Our class field trip collected various specimens in Delaware from several sites. We spent the next two weeks classifying them and then sometimes some taxidermy when they died prematurely. We did all sorts of preservation and went through a really healthy analysis of everything. The kids were amazingly involved.?

Our final session included topics such as motivation of students, tracking, and professional growth of the student teachers and culminated with a discussion of the benefits and difficulties of the VTEL technology and format of our sessions. Highlights of the summary discussion with some of the positive and negative aspects of the sessions follow:

Researcher # 1: Can we go on to some summary questions? What benefits have you received from the VTEL sessions?

Student 4 (rural): I found that it was helpful because I know there was a difference between that part of the country and this part of the country. I think it is important to realize the differences and similarities.

Student 8 (urban): I think the VTEL seminars amongst ourselves were extremely helpful because you realized you weren't alone. It's nice to know that you're not the only one making mistakes - that it happens in this area and Blacksburg as well.

Student 2 (rural): Part of the battle is knowing what you are getting into. In this program I have been able to see education in a very urban environment. Discussing education and teaching in a rural environment has given me a bigger picture of the responsibility that we as educators have. I think that is going to be important whether we are in an urban or rural area. I think it has a big impact on how we view our classrooms and view our situations.

Researcher # 1: Let's expand our discussion to negative aspects of VTEL.

Student 9 (rural): I find it hard. I don't know where to look and where to talk. I think it's kind of hard to actually do this. It's much harder than if you guys were in the same room.

Researcher # 1: Has it gotten easier over the three sessions?

Student 9: We have been in three different rooms, but I guess it has gotten easier.

Student 7 (urban): The pace of the VTEL is annoying to me, and I think we would recognize more in common if we didn't have a pause every time the camera is focusing ... I think you have to spend extra effort coordinating who is going to talk next ... which is more cumbersome.

Researcher # 1: Let's do a little brainstorming about what we can do in the future given this technology ... what can we pursue in the future that would be of interest to you?

Student 1 (urban): Maybe have smaller groups where we can see everyone. It helps to be able to see everyone at once.

Student 3 (urban): I like it when we come up with a set of questions of interest to us. I feel better prepared to come in and discuss things. Maybe the first fifteen minutes more structured discussion, and the rest unstructured.

Student 2 (rural): I really like the idea of structure. If someone solicited particular answers or responses from us individually and prearranged for us to do three or four minute presentations, then allow for some complimentary ideas from our colleagues, that would better address any questions we all might have.

Researcher # 2 : I was going to say something very similar to that and I guess great minds run together. Maybe we can have mini-presentations with the concept of a panel discussion.

Summary and Conclusions

In summary, through video teleconferencing, students were able to reflect on their own field placements by comparing and contrasting with those students working in different cultures and locations. Students were very curious about the program and about student teaching experiences in cultures different from their own. For example, although rural students were not exposed to as much cultural diversity in their own programs, they learned what they may expect when they apply for jobs and are confronted with completely different teaching environments. All students reflected on their own teaching and relevant topics such as standards of learning by comparing how the standards were being met in different school divisions. The teleconferencing facilitated sharing of

different viewpoints and teaching strategies.

The process of collaborative action research was helpful in deciding what questions to ask and what topics should be addressed. Student feedback was received in methods classes or through course list serve. This feedback was used to design the structure of subsequent teleconferences. Communication between the researchers from the two sites was enhanced by regular e-mails and phone conversations. This mutual support network is essential for planning and articulation of strategies to use the technology effectively.

References

Bates, A. W. (1991). Third generation distance education: The challenge of new technology. Research in Distance Education, 3(2), 10-15.

Carr, W., & Kemmis, S. (1983). Becoming critical: Knowing through action research. Geelong, Australia: Deakin University Press.

Elliott, J. (1990). Teachers as researchers: Implications for supervision and for teacher education. Teaching & Teacher Education, 6(1), 1-26.

Freeman, M. (1998). Video conferencing: A solution to the multi-campus large classes problem? British Journal of Educational Technology, 29(2), 197-210.

Lewin, K. (1947). Frontiers in group dynamics. Human Relations, 1, 5-41.

Miller, J. W., McKenna, M. C., & Ramsey, P. (1993, June). An evaluation of student content learning and affective perceptions of a two-way interactive video learning experience. Educational Technology, 33, 51-55.

Noffke, S. E. (1995). Action research and democratic schooling: Problematics and potentials. In S. E. Noffke & R. B. Stevenson (Eds.), Educational action research: Becoming practically critical (pp. 1-10). New York: Teachers College Press.

Noffke, S. E., & Zeichner, K. W. (1987, April). Action research and teacher thinking. Paper presented at the annual meeting of the American Educational Research Association, Washington, DC.

Pate, P. E. (1997). Teaming and decision making. In T. S. Dickinson, & T. O. Erb (Eds.), Teaming in middle schools (pp. 425-442). Columbus, Ohio: National Middle School Association.

Pirkl, R. (1990). Video teleconferencing: Tapping an emerging resource.

Community, Technical, and Junior College Journal, 61(2), 24-27.

Rowntree, D. (1990). Teaching through self-instruction. How to develop open learning materials (2nd ed.). New York: Nichols Publishing.

Saurino, D. R. (1998). A qualitative study of middle school collaborative team action research (Doctoral dissertation, University of Georgia, 1998). Dissertation Abstracts International.

Saurino, D. R., & Saurino, P. L. (1996). Collaborative teacher research: An investigation of alternative assessment. Current Issues in Middle Level Education, 5(2), 50-72.

Schiller, J., & Mitchell, J. G. (1993). Interacting at a distance: Staff and student perceptions of teaching and learning via video conferencing. Australian Journal of Educational Technology, 9(1), 41-58.

Willis, B. (1992). Effective distance education. A primer for faculty and administrators (Monograph Series in Distance Education No. 2). Fairbanks, AK: University of Alaska Center for Cross-Cultural Studies.

Willis, B. (Ed.) (1994). Distance education: Strategies and tools. Englewood Cliffs, NJ: Educational Technology Publications.

Wraga, W. G. (1997). Interdisciplinary team teaching: Sampling the literature. In T. S. Dickinson, & T. O. Erb (Eds.), Teaming in middle schools (pp. 325-344). Columbus, Ohio: National Middle School Association.